Title: Lemonade Stand

Brief Overview:

This unit involves designing and building a lemonade stand and creating a marketing and organizational plan for a lemonade sale. The sale will occur during this whole school's lunch as the culminating activity for the project. This unit involves cross-curricular connections to art, science, social studies, language arts, and technology.

Links to Standards:

- **Mathematics as Problem Solving**
  Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.

- **Mathematics as Communication**
  Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

- **Mathematics as Reasoning**
  Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.

- **Mathematical Connections**
  Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.

- **Estimation & Computation**
  Students will demonstrate their ability to apply estimation strategies in computation, with the use of technology, in measurement, and in problem solving. They will determine reasonableness of solutions.

- **Number Sense & Operations**
  Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials. They will choose appropriate operations and describe effects of operations on numbers.

- **Geometry & Spatial Sense**
  Students will demonstrate their ability to describe and apply geometric relationships using one, two, and three dimensional objects. They will demonstrate congruency, similarity, symmetry, and reflections and apply these concepts to the solution of geometric problems.

- **Measurement**
  Students will demonstrate and apply concepts of measurement using non-standard and standard units and metric and customary units. They will estimate and verify measurements. They will apply measurement to interdisciplinary and real-world problem solving situations.

Grade/Level:

Grade 3

Duration/Length:

This unit will take approximately ten days to complete (five class sessions and five days of construction, marketing, and selling).

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Estimating, rounding and place value
- Money, i.e., making change
- Addition and subtraction with regrouping
- Word processing
- Basic concepts of liquid measurements
- Basic calculator use

Objectives:

Students will:

- identify different geometrical shapes and characteristics.
- determine which geometrical shapes are most stable in the construction of the stand.
- write an informational letter to their parents describing this project.
- write a persuasive letter to the principal for permission to sell lemonade.
- access Internet and add to website to advertise project.
- write advertisement for lemonade sale for inclusion in school newspaper.
- work cooperatively with partners and in groups.
- decide and prove what geometrical shapes are most stable for furniture construction.
- design and create model of stable lemonade stand.
- present model and discuss findings with peers.
- write class letter to request supplies from parents and art teacher.
- read recipes, make, and sell lemonade.
- estimate using an anchor.
- estimate amount of supplies by taking school survey.
- brainstorm to create posters/signs for advertising lemonade sale.
- use computer to help generate art work for project.
- role play customer/vendor, use calculator to make change to simulate sale of lemonade .
- construct a lemonade stand.
- write and announce a reminder about lemonade sale on morning announcements.
- estimate how much money will be made from the sale of lemonade.
- compare estimates with money made from sale.
- determine profit or loss.
- write class donation letter.
- distribute profits from sale of lemonade to a “worthy” cause.
- evaluate their thinking/learning in reflective journals; students utilize word wall.

Materials/Resources/Printed Materials:

- KWL chart geometrical shapes poster
- 3 x 5 index cards for word wall
- On Market Street, by Anita Lobel, 1981
- chart paper
- markers
- chalk

- geometrical shapes poster
- flimsy model-paper, straws, toothpicks, tagboard, glue, tape
- persuasive writing rubric
- flexible linking-straws, adapted from Gerard Prentice, Arithmetic Teacher, 1988
- Geo-Flex Straw Construction sheet, adapted from Bette Kundert, Howard County Public Schools
- student reflection journals
- craft sticks
- pipe cleaners
- marshmallows
- coffee stirrers
- variety of recipe books
- anchor sample
- anchor homework paper
- computer
- poster board
- banner paper
- crayons
- rubric
- scenario strips
- hats
- play money
- tray for money denominations
- calculators
- homework sheet for scenarios
- building materials: donated and collected materials, hammer, saw, nails, desk/table,
- lemonade stand
- Supplies for making lemonade: lemons, sugar, water, spoons, pitcher/containers, knives, ice chests
- morning announcement sheet
- lemonade
- money for making change
- tray for collecting money
- cups

Development/Procedures:

Day 1:

- Introduce lemonade project to class, and begin KWL chart. (The KWL chart diagnoses student base; provides motivation, i.e. level of concept; allows for students' metacognitive processes to focus on subject; summarizes student progress; allows for a continuous review when KWL chart is displayed in classroom; student's personal KWL chart individualizes student learning, while class chart displays collective learnings.)
- Define geometry; begin word wall.
- Read On Market Street, to connect marketing and geometry skills.
- Have students explore classroom to identify geometrical shapes.
- Take students on tour of school building to identify how geometrical shapes are used in a real-world setting.
- Create class generated letter to parents discussing project and need for parent volunteers.
- Assign homework: students chart different ways geometrical shapes are used at home.

- Materials: KWL chart, 3 x 5 index cards for word wall, On Market Street, chart paper, markers, chalk, and geometrical shapes poster.

Day 2:

- Review Day 1 activities and homework; have students add to KWL chart and word wall.
- Pose the question: How will we make the most stable lemonade stand? Make a flimsy model for demonstration, (it will fall apart), Ask students: Is this model stable?
- Put students into cooperative groups; students will explore building polygons, and discuss stability of their models using flexible linking straws (see attachment).
- Discuss cooperative groups' findings and add to KWL chart and word wall.
- Have students write reflections from their investigations into their journals (label pictures).
- Assign homework with students' comparing furniture in their homes to their model (applying new geometrical knowledge).
- Write a persuasive letter to the principal convincing her to allow students to sell lemonade (include the parent volunteer letter as an attachment, be sure to include how students plan to distribute the profits, if any, from the sale).

- Materials: KWL chart, 3 x 5 index cards for word wall, flimsy model-paper, straws, toothpicks, tagboard, chart paper, persuasive writing rubric, flexible linking-straws, (adapted from Gerard Prentice, Arithmetic Teacher, 1988), Geo-Flex Straw Construction sheet (adapted from Bette Kundert, Howard County Public Schools), and student reflection journals.

Day 3:

- Review Day 2 activities and homework; read KWL chart.
- Put students into groups of two, to build model of lemonade stand.
- Have students compare and contrast their model with other groups' models.
- Write advertisement for lemonade sale for inclusion in school newspaper, school website address.
- Add to KWL chart and word wall.
- Have students write and illustrate their findings and reflections into their journals.

- Materials: KWL chart, 3 x 5 index cards for word wall, toothpicks, flexible linking-straws, craft sticks, glue, tape, pipe cleaners, marshmallows, coffee stirrers, and student reflection journals.

Day 4:

- Review Day 3 activities, read KWL chart.
- Share rubric of student presentation of models.
- Present model and discuss findings with peers.
- Vote on the "BEST" (most stable) model to use for final lemonade stand.
- Discuss and vote on best building materials for final lemonade stand (assist if necessary).
- Write class letter to request supplies from parents and art teacher.
- Add to KWL chart and word wall.

- Materials: KWL chart, 3 x 5 index cards for word wall, rubric for student presentations; chart paper, and markers.

Day 5:

- Review Day 4 activities, read KWL chart and share exemplary student journal entries.
- Put students into cooperative groups to read lemonade recipes.
- Vote on the "BEST" recipes based on cost factor and amount of supplies needed.
- Model estimating using an anchor.

- Have students use their class size as the anchor to estimate how many glasses of lemonade to make for their lemonade sale.
- Work cooperatively with partners and in groups.
- Assign anchor paper homework to students.
- Add to KWL chart and word wall.

- Materials: KWL chart, 3 x 5 index cards for word wall, a variety of recipe books, anchor sample, computer, and anchor homework paper.

Day 6:

- Review Day 5 activities, read KWL chart.
- Brainstorm various ways to advertise lemonade sale to grade three students.
- Design, make and display posters/banners based on rubric.
- Use computer to help generate art work for project.
- Add to KWL chart and word wall.

- Materials: KWL chart, 3 x 5 index cards for word wall, tag board, poster board, markers, banner paper, crayons, paint, rubric, and computer.

Day 7 and Day 8:

- Review Day 6 activities, read KWL chart.
- Put students into two cooperative groups (one group for role play, one group construction).
- Demonstrate role playing of customer/vendor at a lemonade stand; Group A - students in pairs: use scenario strips.
- Use calculator to make change to simulate sale of lemonade; Group A activity.
- Construct lemonade stand based on models; Group B activity.
- Switch groups: Group A-Day 7 Role Play --Day 8 Construct Stand, Reverse for Group B.
- Assign homework using scenarios for buying and selling lemonade.
- Add to KWL chart and word wall.

- Materials: KWL chart, 3 x 5 index cards for word wall, scenario strips, hats, play money, tray for money denominations, calculators, homework sheet, building materials: donated and collected materials, hammer, saw, nails, desk/table, glue, tape, markers, and paint.

Day 9:

- Review Day 7 and 8 activities, read KWL chart.
- Review liquid measurement.
- Make the lemonade from student selected recipe and store.
- Set up the stand for actual sale.
- Write a morning announcement advertising and reminding the students of sale.
- Add to KWL chart and word wall.

- Materials: KWL chart, 3 x 5 index cards for word wall, lemonade stand, lemons, sugar, water, spoons, pitcher/containers, knives, ice chests, and morning announcement sheet.

Day 10:

- Announce lemonade sale during morning announcements.
- Divide students into groups for selling lemonade (shifts).
- Remind students of making change concepts.

- Remind students to practice customer relations during sale.
- Estimate how much money will be made from the sale.
- Sell lemonade!!! ENJOY!

- Materials: KWL chart, 3 x 5 index cards for word wall, morning announcement sheet, lemonade, ice, cups, money for making change, tray for collecting money, and lemonade stand.

Day 11:

- Review culminating activity.
- Compare estimates with actual money made.
- Show how profit/loss is made.
- Determine actual profit or loss.
- Distribute profits to worthy cause of students choice/write class letter.
- Donate lemonade stand to school for future sales.
- Summarize learnings of lemonade stand activity in reflection journal.

- Materials: KWL chart, 3 x 5 index cards for word wall, morning announcement sheet, lemonade, ice, cups, money for making change, tray for collecting money, and lemonade stand.

Performance Assessment:

Day 1:

- Objectives: Identify different geometrical shapes and characteristics; determine which geometrical shapes are most stable in the construction of the stand, and write an informational letter to parents describing project.

- Assessment: KWL chart, teacher observation as students explore geometrical shapes, and class writing of parent letter.

Day 2:

- Objectives: Write a persuasive letter to the principal for permission to sell lemonade, evaluate their thinking/learning in reflective journals; students utilize word wall; work cooperatively with partners and in groups; decide and prove what geometrical shapes are most stable for furniture construction.

- Assessment: KWL chart, teacher observation as students explore most stable geometrical shapes in furniture construction in cooperative groups, models produced, class discussion of proofs, class writing of persuasive letter, and student journal entry.

Day 3:

- Objectives: Access Internet and add entry to website to advertise project; write advertisement for lemonade sale for inclusion in school newspaper; and build a lemonade stand model, based on mathematical concepts.

- Assessment: KWL chart, teacher observation as students build stable models in cooperative groups, models produced, student discussion of comparing and contrasting models, and student journal entry.

Day 4:

- Objectives: Present model and discuss findings with peers; and write class letter to request supplies from parents and art teacher.

- Assessment: KWL chart, student oral presentation of models, and rubric of presentation.

Day 5:

- Objectives: Read recipes and decide on the most cost effective lemonade recipe, and estimate using an anchor.

- Assessment: KWL chart, teacher observation of anchor activity, and student recipe selection.

Day 6:

- Objectives: Brainstorm to create posters/signs for advertising lemonade sale; use computer to help generate art work for project; and take school survey to help determine estimated supplies for sale.

- Assessment: KWL chart, student posters/signs/banners, teacher observation of students, and work at computer.

Days 7 and 8:

- Objectives: Role play customer/vendor, use calculator to make change to simulate sale of lemonade, and construct a lemonade stand based on models.

- Assessment: KWL chart, teacher observation of students making change and use of calculator, student role playing, and lemonade stand.

Day 9:

- Objectives: Make lemonade, set up lemonade stand, and write morning announcement to remind school of lemonade sale.

- Assessment: KWL chart, lemonade product, lemonade stand, and morning announcement.

Day 10:

- Objectives: Announce lemonade sale, and estimate money made from sale.

- Assessment: KWL chart, lemonade stand, morning announcement, lemonade sale, and teacher observation of students making change and use of calculator.

Day 11:

- Objectives: Distribute profits from sale of lemonade to a "worthy" cause, summarize reflections of project in journal, compare estimate of actual money made, determine actual profit or loss, and donate lemonade sale to school for future sales.

- Assessment: KWL chart, profit or loss, letter of donation of stand to school, and students' journal entries.

Extension/Follow Up:

- Offer students as mentors to other classes interested in a class sales project.
- Write a letter to the charity organization, finding out how the profits from the sale were used.
- Use models in creating a class science fair exhibit.
- Include student summary of culminating activity in school's homepage.
- Write and send thank you letters to teachers, students, parents, principal for the success. of the sale

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Rubric for Writing a Letter of Persuasion

POINTS	ITEMS
1	Include five parts of a letter: Greeting, Closing, Body, Conclusion, and Signature
1	Include an introductory statement
1	Give two or more reasons to support your position for sale of lemonade
1	Include statement about asking for parent volunteers
1	Give information about the sale of lemonade
1	Include a closing statement

Scoring the Persuasive Letter

Points:

6-5 = Very Good
4-3 = Okay
2-0 = Needs Improvement

Reflective Journal Question:
"How do I know our class letter is a good letter?"

Rubric for Student Presentations

Student Name	Identify Geometric Shapes Used	Tell Why Model is Stable	Display Model to Class	Voice Level	Overall Rating

1. Large lemonade = $.25 A student gives you $1.00 and asks you for one large lemonade. What is the change?

2. Large lemonade = $.25 A student gives you $1.00 and asks you for two large lemonades. What is the change?

3. Large lemonade = $.25 A student gives you $1.00 and asks you for three large lemonades. What is the change? Write a math sentence to show how you found your answer.

4. Small lemonade = $.10 and Large Lemonade = $.25. The student gives you $1.00 and asks you for one large lemonade and one small lemonade. What is the change?

5. Small lemonade = $.10 and Large Lemonade = $.25. The student gives you $1.00 and asks you for two large lemonade and one small lemonade. What is the change? Write a math sentence to show how your found your answer.

6. Small lemonade = $.10 and Large Lemonade = $.25. The student gives you $1.00 and asks you for two large lemonade and two small lemonades. What is the change?

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7. Small lemonade = $.10 The student gives you $1.00 and asks you for three small lemonades. What is the change?

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8. Small lemonade = $.10 The student gives you $1.00 and asks you for ten small lemonades. What is the change? Write a math sentence to show how you found your answer.

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9. Small lemonade = $.10 and Large Lemonade = $.25. The student gives you $1.00 and asks you for three large lemonades and five small lemonades. What is the change? Write a math sentence to show how your found your answer. What do you say to your customer? Explain your response to the customer.

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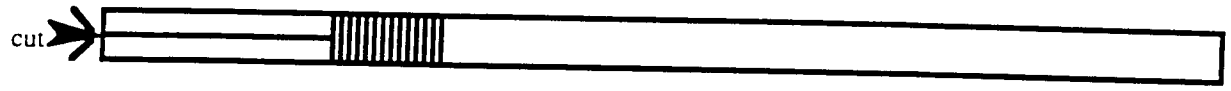
10. Small lemonade = $.10 and Large Lemonade = $.25. The student gives you $1.00 and asks you for four large lemonades and one small lemonade. What is the change? Write a math sentence to show how your found your answer. What do you say to your customer? Explain your response to the customer.

GEO-FLEX STRAW CONSTRUCTION

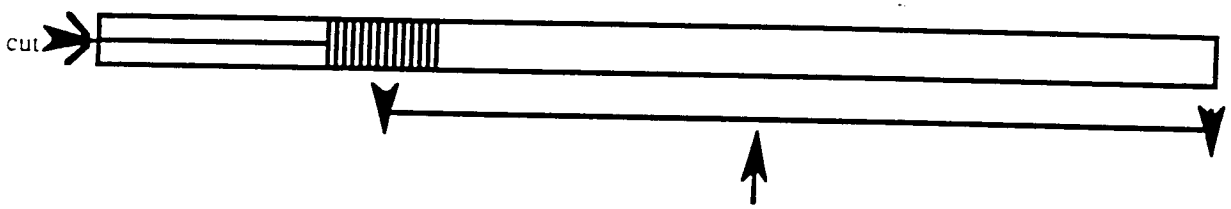
(Different Length Straws)

•Purchase 60 flexible drinking straws for each kit you plan to make.

- Slit the drinking end of the straw from the edge to the flexible joint.



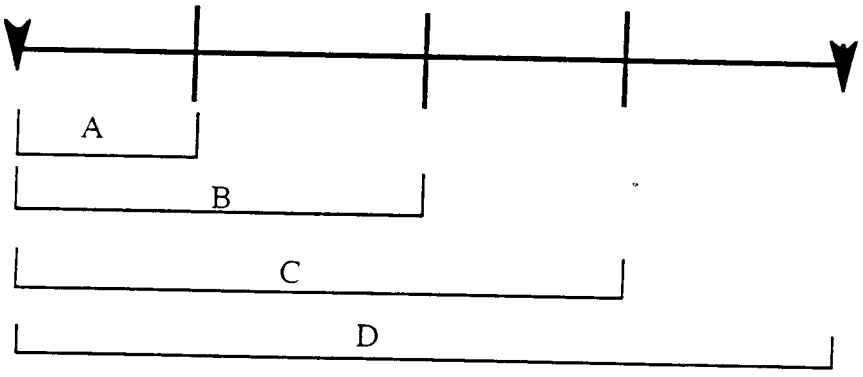
- Place the straw which is bent at the flex joint on a blank piece of paper so that the long end of the straw is touch the paper. Draw a line the length of the straw from the bottom edge to the flex joint.



Line drawn to show length of long end of straw.

- Draw marks on the line to divide it into four lengths.

- Make 15 of each length flex-straw by laying the straw on the line to determine where to cut.



- Place tape on each straw cut to indicate length: A = green; B = yellow; C = red, and D = blue

- Place straws in quart-sized ziplock bag.

Geometric Shapes

name _____ date _____

Directions: Find 5 examples of each shape listed below. Glue them in the correct place.

Triangle	Square
Circle	Rectangle

Worthington Elementary School

4570 Roundhill Road

Ellicott City, Maryland 21043

Telephone: (410) 313-2825

Fran Donaldson
Principal

Jane S. Sims
Assistant Principal

November 3, 1997

★★ Reach for the Stars! ★★

Dear Parents/Guardians of Ms. Lagioia's Math Class:

Starting today in our math class, we will be focusing on a unit called "Lemonade Stand". During this unit, the students will be using many different math skills: geometry, addition, subtraction, money, making change, and problem solving.

We will be using language arts skills in order to write a persuasive letter to the principal. In order for us to build a lemonade stand we need to decide what the money will be used for, i.e. charity, math class function, etc., make posters and advertise for the sale. Finally, we will sell the lemonade to the students of Worthington.

We will be asking for your support during the course of this unit. We will need building supplies. We will need nails, hammers, wood, and the expertise to assemble our stand. So we are thanking you in advance for all of your best wishes and material support.

We will be keeping you updated on our progress.

Sincerely,

Ms. Lagioia / Ms. West

S.D.

Ms. Lagioia and Ms. West's Math Class

Please check the boxes you can help us with.

☐ wood (2'x4')	☐ nails	☐ toothpicks
☐ actual building	☐ lemons	☐ sugar
☐ cups (4 oz. and 8 oz.)	☐ lemonade recipes	

STUDENT NAME _____ PARENT SIGNATURE _____

PLEASE RETURN A.S.A.P. THANK YOU!!